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# Solar-Powered Planes Take Flight

The light, uncrewed aircraft could provide surveillance and telecommunications that balloons and satellites can't—and stay aloft for months

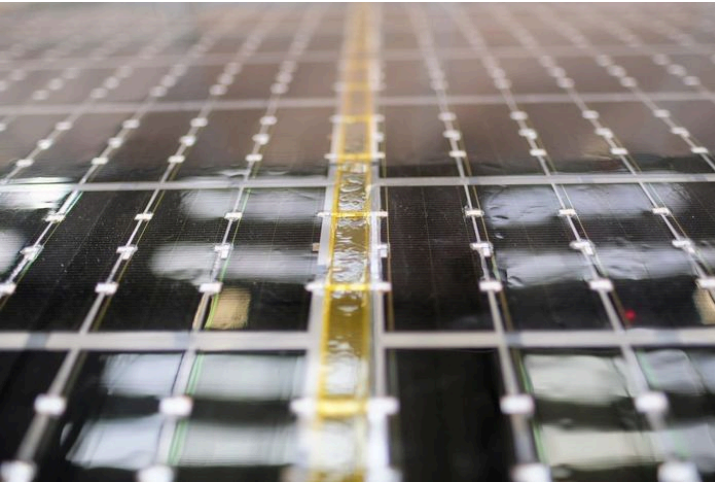
By *Phred Dvorak* [Follow](#)

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Imagine airplanes powered only by energy from the sun, some so light they can be launched from the ground by hand, others gathered in giant “parking lots” in the stratosphere.

Those are the types of aircraft being developed now that are bringing the dream of solar-powered flight closer to reality, with planes that act very differently from the jetliners of today.

Solar-powered planes won't be flying people to their next vacation spot anytime soon. But these prototypes, most of which operate without humans, could lead to new alternatives for aerial surveillance on high-risk missions and emergency telecommunications in disaster zones, industry executives say. Aviation giants, telecommunication companies, venture investors and military agencies are already spending millions of dollars developing the planes and their technologies.



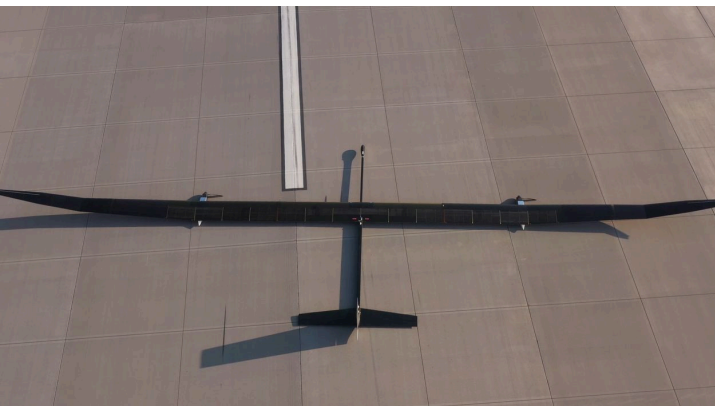
The Zephyr, like other solar planes, is powered by solar panels that cover the wings. PHOTO: AALTO

“It’s like in the early days of aviation” as companies, governments and investors try to figure out what these planes can do and what could be economically viable, says Eric Raymond, a solar-aircraft designer and glider pilot who started experimenting with solar-powered flight in 1979. “The potential is there, I do believe in it after all these years.”

Solar aircraft typically soak up the sun’s energy via panels that cover the wings—and sometimes the body, sides and tail as well. The advantage of solar power is that it is free and emissionless—much more environmentally friendly than burning jet fuel. A solar plane never needs refueling, and in theory it can stay in the air as long as the sun is shining. That brings perpetual flight within reach, if the solar is paired with batteries that charge during the day and power the aircraft and its payload at night.

Advances in battery technology and cost have finally made it feasible to power a solar plane for longer distances or through the night, solar-aircraft executives say, albeit with much less power than jet fuel, pound for pound. That means today’s solar aircraft are extremely lightweight and slow. Many fly around the speed of a slow car. They have trouble withstanding bad weather. Most can’t carry heavy loads.

“A domestic hair dryer is probably consuming the same amount of power that we’re using during the night to fly the airplane,” says Dave Corfield, who heads a unit of U.K. defense and aerospace contractor BAE Systems that is building a solar-and-battery-powered aircraft called the Phasa-35.



U.K. defense contractor BAE Systems expects its solar-plane prototype, Phasa-35, to start by offering services to the military. PHOTO: BAE SYSTEMS

The planes have some advantages over current aircraft used for services like surveillance.

Most of the companies trying to commercialize solar planes are building aircraft that are lightweight, autonomous and can fly at altitudes and for lengths of time that humans can't tolerate. Unlike balloons, solar planes are steerable, a big advantage for monitoring a target on the ground or providing telecom coverage without being blown off course. They are also cheaper and closer to Earth than satellites, putting them in a sweet spot for services that can't currently be offered by either, executives in charge of solar-aircraft projects say.

The planes can capture higher resolution photos or video than satellites, or deliver broadband internet from the air, another thing satellites can't do. Executives envision programming them to fly to the other side of the globe on surveillance missions that last months, making them a safer and longer-term alternative to monitoring by piloted planes. Solar aircraft could be sent to disaster zones to provide emergency telecommunications then flown away when they are no longer needed.

Aerospace engineer and military drone designer Robert Miller says he first became interested in solar-powered airplanes several years ago, when the U.S. Defense Advanced Research Projects Agency, or Darpa, asked him to come up with a surveillance craft that could locate Joseph Kony, an African warlord accused of kidnapping and killing thousands of people in northern Uganda.

To do that, Miller figured he would need an aircraft that could travel long distances to a specified location and hang around for weeks at a time—something satellites in orbit can't do—carrying a special radar that can track movement under the dense jungle canopy where Kony was believed to be hiding.

He landed on the Solar Impulse 2, a Swiss single-seater solar-powered plane with a wingspan as broad as a jumbo jet, which had recently become the first to circumnavigate the globe in 2016.

Miller started a company, bought the Solar Impulse 2 and retrofitted it to fly without humans, snagging a \$5 million contract from the U.S. Navy along the way. The aircraft, renamed Skydweller, is flying test flights out of Mississippi, and the company is building a second that Miller hopes to have ready for delivery next year. It is heavier and can carry more than most of the other solar-plane prototypes, and flies at the same altitude as commercial airplanes.



Skydweller, which has a contract with the U.S. Navy, is robust enough to carry relatively heavy surveillance equipment. PHOTO: SKYDWELLER AERO

One of the biggest challenges, Miller says, is ensuring the plane is robust enough to withstand winds and weather while it stays aloft for a targeted 90 days at a time.

Other solar-aircraft designers are trying to sidestep that problem by flying above the weather in the stratosphere, an unregulated and largely empty atmospheric layer that starts several miles above the surface of the Earth but is still much lower than the zone where the closest satellites orbit.

BAE Systems' Phasa-35, for example, acts "somewhere between a balloon and a paraglider" as it sails to the stratosphere, and then behaves like a "steerable satellite" after, says Corfield.

The plane, which has the wingspan of a narrow-body jet, weighs as much as two business-class seats and travels at a maximum of 35 miles an hour during its nine-hour ascent to cruising altitude.

To help the Phasa-35 get up there safely, the company is developing a five-dimensional weather-forecasting system. The system will predict the probability of various atmospheric conditions at different times, locations and altitudes along the aircraft's launch path. BAE Systems then plans to use artificial intelligence to crunch the data to find the ideal route to the stratosphere. The company hopes to have a commercial craft by the end of 2027, says Corfield.

Other prototypes, such as Airbus's 165-pound Zephyr, weigh less and are more fragile. The Zephyr is so light that it is currently launched by a crew of five people running on the ground. The company is building its first air base in Kenya, where good weather and mild winds increase the chances of navigating safely during the 10 hours it takes to get to the stratosphere and the 16 hours to come down, says Samer Halawi, a telecommunications veteran who heads the Airbus unit developing the aircraft.



Japanese telecommunications company SoftBank Corp. is developing a solar-powered aircraft.

PHOTO: SOFTBANK CORP.

A consortium of Japanese companies led by mobile giant NTT Docomo last week announced a commitment to invest \$100 million in the Airbus unit developing the Zephyr. Airbus is planning to test a Zephyr providing 5G service later this year, and hopes to start full commercial services, including telecommunications, in 2026. Rival Japanese telecommunications company SoftBank Corp. is developing its own solar-powered aircraft that it describes as a telecommunications base station in the sky.

Raymond's Sunseeker Duo is one of the few solar planes that is built to carry people. The experimental two-seater motorized glider, which currently cruises around Europe, can go on trips that last as long as 12 hours.



Eric Raymond in the Sunseeker Duo, a rare solar plane built to carry people. PHOTO: ERIC RAYMOND/SOLAR FLIGHT INC.

Raymond says he has designed a six-seater solar plane that could be useful hopping between remote communities with poor roads in sunny climates like Africa, where the benefits of not needing to buy or carry fuel outweigh a travel speed of around 60 miles an hour and an inability to fly in bad weather.

The challenge is finding deep-pocketed investors willing to fund the manufacture and certification of such aircraft, Raymond says, but "there's no question in my mind that if we could get something to production that would be very successful."

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